

**U.S. DEPARTMENT OF ENERGY
OFFICE OF CIVILIAN RADIOACTIVE WASTE MANAGEMENT**

**PRESENTATION TO
THE NUCLEAR WASTE TECHNICAL REVIEW BOARD**

**SUBJECT: EARLY SITE SUITABILITY
EVALUATION EFFORT STATUS**

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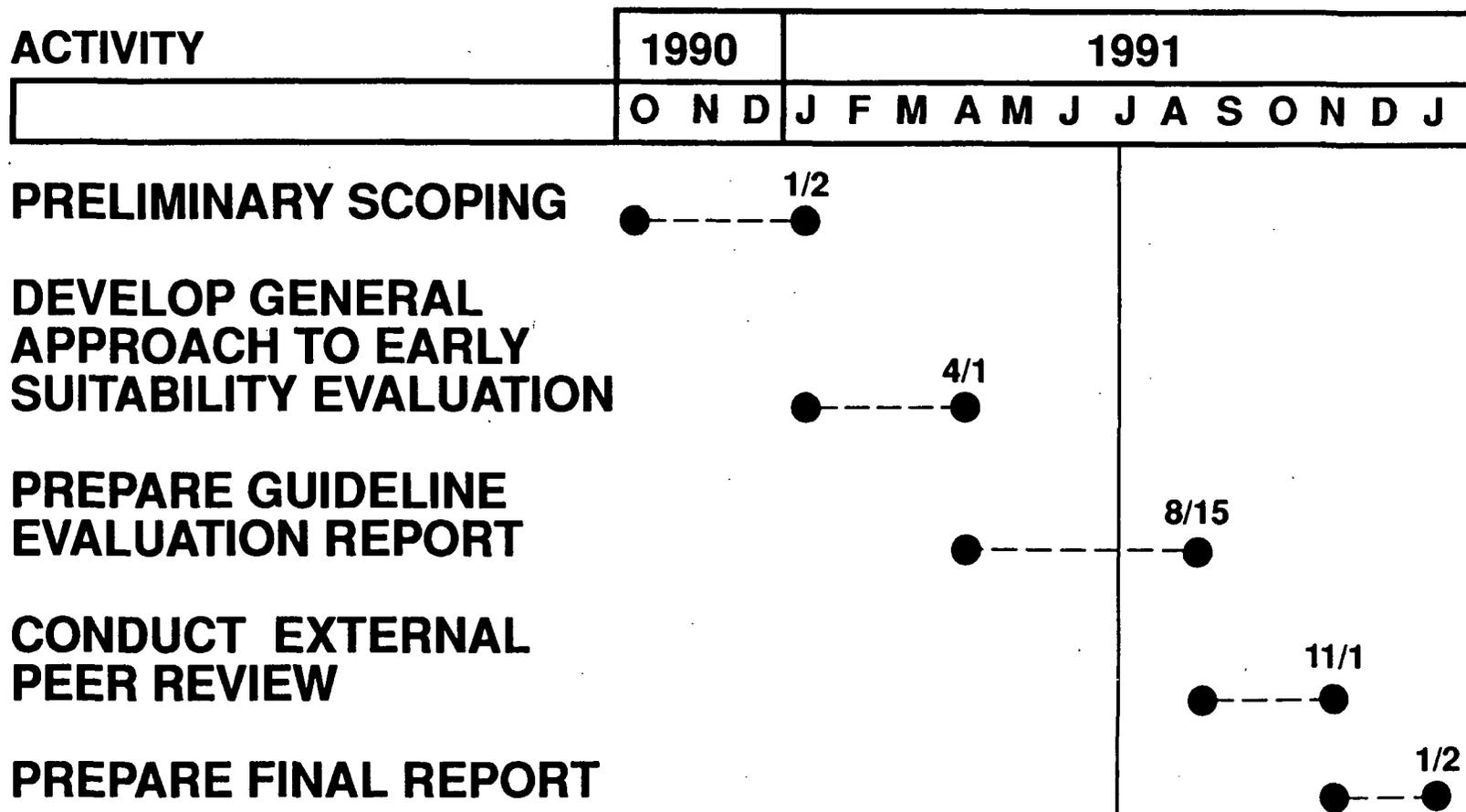
JULY 15-17, 1991

STATUS AND EVALUATION METHODS FOR EARLY SITE-SUITABILITY EVALUATION

AGENDA

- **OVERVIEW OF ESSE TASK**
- **PROCEDURES FOR EVALUATING
SITE AGAINST DOE GENERAL SITING
GUIDELINES (10 CFR PART 960)**
- **STATUS OF GUIDELINE EVALUATIONS**

EARLY SITE SUITABILITY EVALUATION TASK



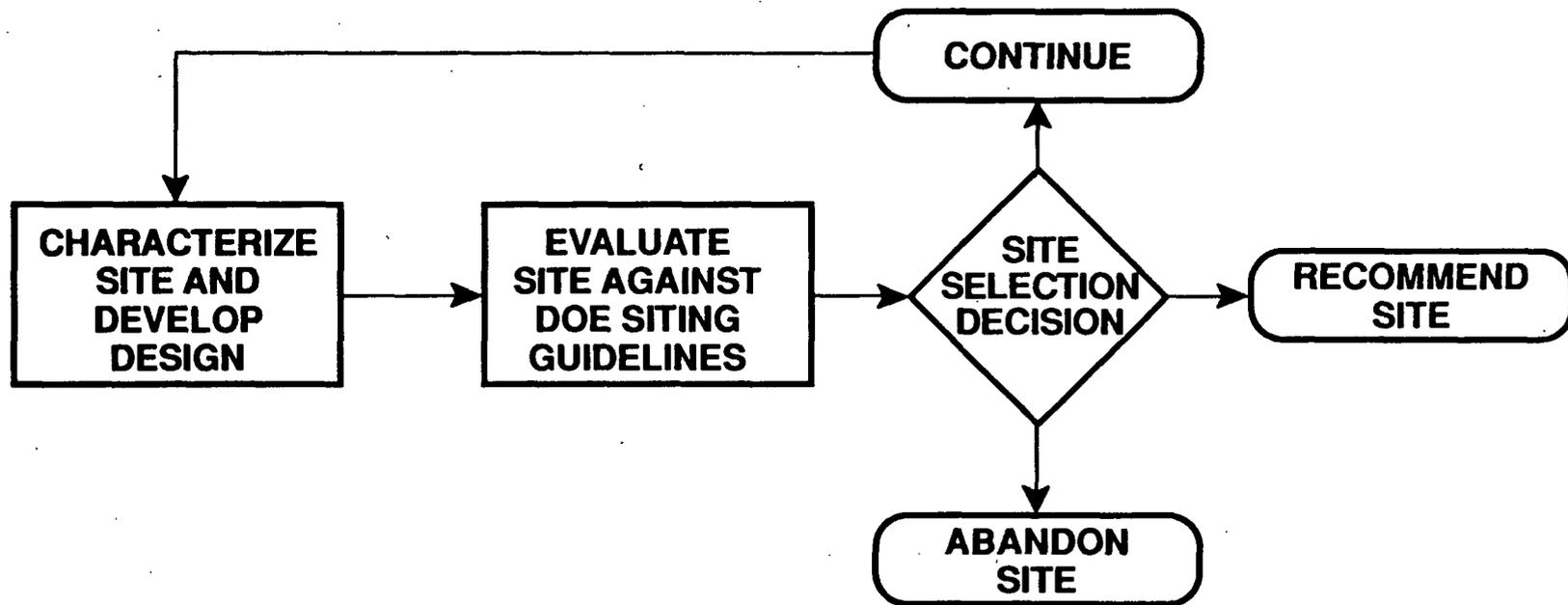
BACKGROUND: EARLY SITE-SUITABILITY EVALUATION

- **ADDRESSES COMMITMENTS MADE BY THE SECRETARY IN HIS 60-DAY REORT**
- **RESPONSIVE TO NWPAA AND SITING GUIDELINES**
- **PROVIDE BASIS FOR ITERATIVE SUITABILITY EVALUATIONS THROUGHOUT SITE CHARACTERIZATION**

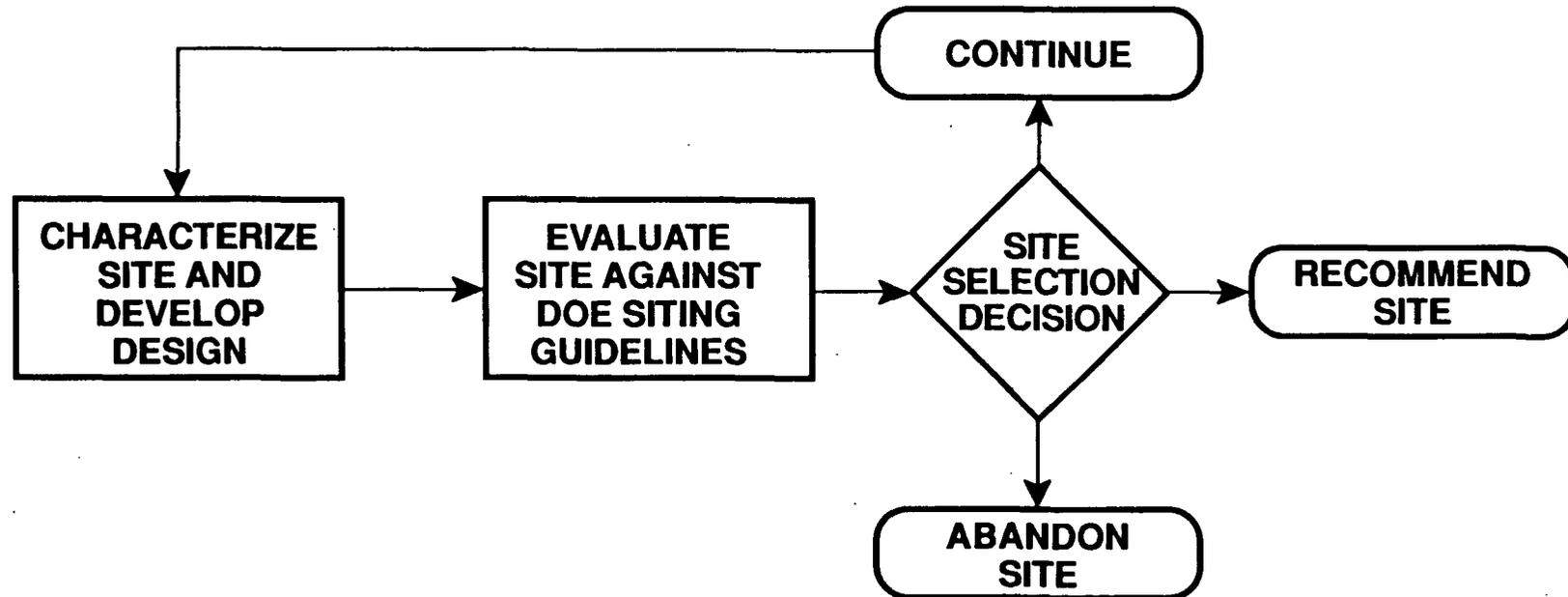
OBJECTIVES: EARLY SITE-SUITABILITY EVALUATION

- **DEVELOP AN APPROACH WITHIN THE FRAMEWORK OF THE SITING GUIDELINES FOR EVALUATING SITE SUITABILITY DURING SITE CHARACTERIZATION**
- **PROVIDE GUIDELINE-BY-GUIDELINE STATUS OF SUITABILITY OF YUCCA MOUNTAIN**

AN ITERATIVE APPROACH IS PROPOSED FOR EVALUATING SITE SUITABILITY



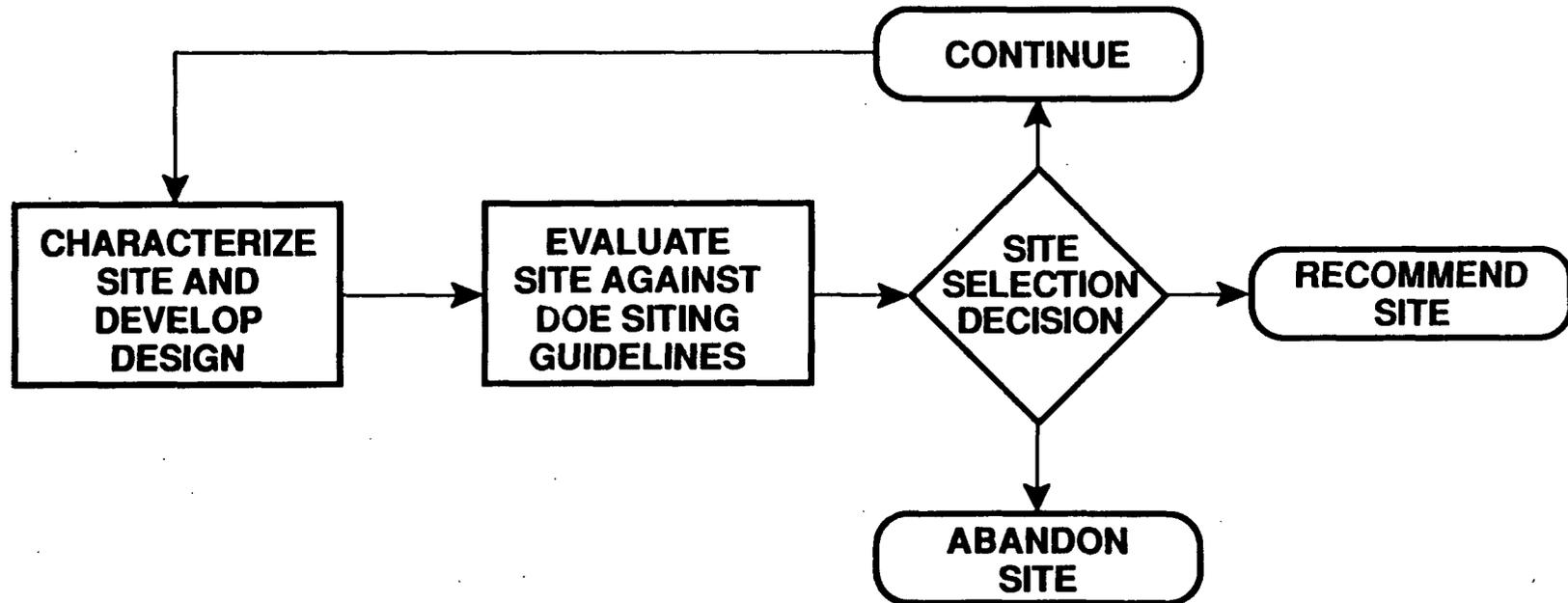
EVALUATIONS ARE BASED ON AVAILABLE INFORMATION ABOUT THE SITE AND DESIGN



INFORMATION THAT IS EVALUATED

- PRESENT UNDERSTANDING OF SITE CHARACTERISTICS
- AVAILABLE DESIGN OF ENGINEERED SYSTEM
- PRESENT REGULATIONS

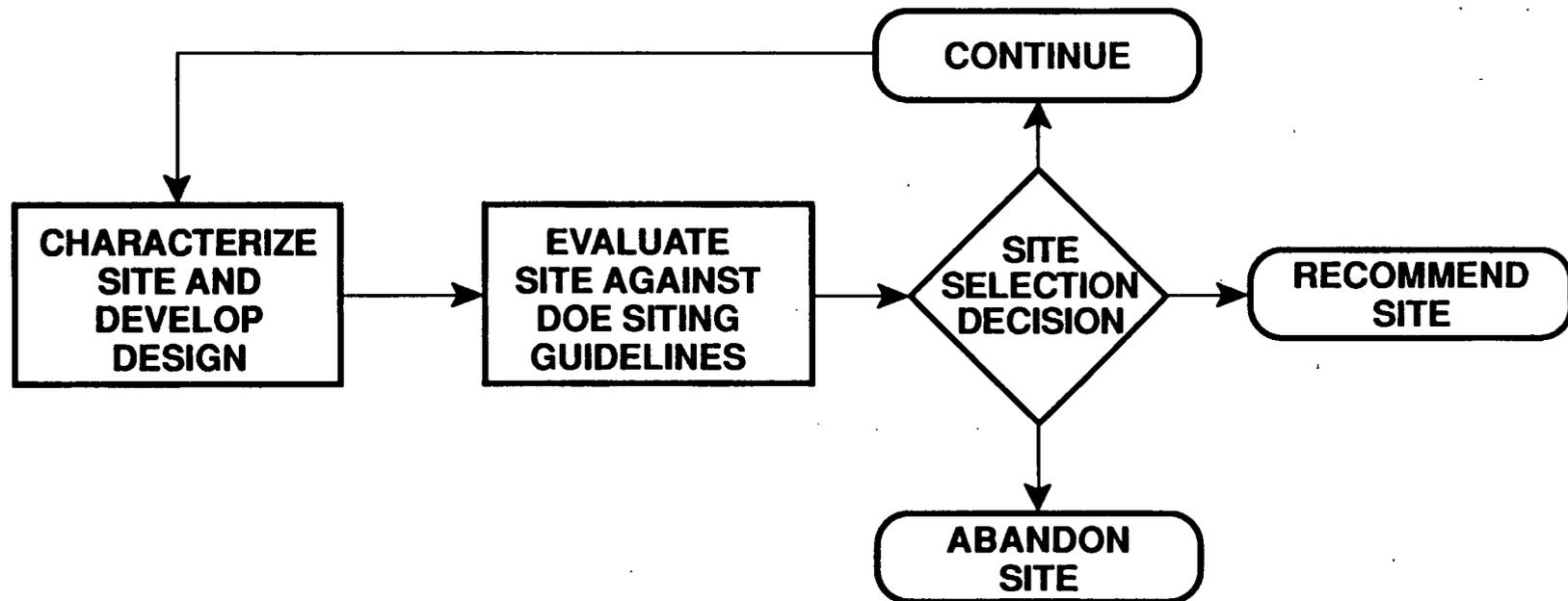
THE METHOD EVALUATES AVAILABLE INFORMATION AGAINST THE SITING GUIDELINES IN 10 CFR PART 960



ELEMENTS OF THE EVALUATION

- EVALUATING DISQUALIFYING AND QUALIFYING CONDITIONS
- MAKING LOWER-LEVEL AND HIGHER-LEVEL FINDINGS REGARDING THESE CONDITIONS
- REEVALUATING WITH UPDATED INFORMATION

SITE-SELECTION DECISIONS MAY INCORPORATE ADDITIONAL FACTORS



CONSIDERATIONS WHEN MAKING DECISIONS

- STATUS WITH REGARD TO SITING GUIDELINES
- AVAILABILITY OF TESTS OR ACTIVITIES TO OBTAIN NEEDED INFORMATION
- VALUE OF ADDITIONAL WORK RELATIVE TO ITS COST
- RESULTS OF ENVIRONMENTAL STUDIES
- SUFFICIENCY OF ANALYSES FOR LICENSING PURPOSES
- OTHER MANAGEMENT CONSIDERATIONS

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- **STATUS OF GUIDELINE EVALUATIONS**

DOE SITING GUIDELINES ARE ORGANIZED TO FOCUS ON KEY REQUIREMENTS

THERE ARE FOUR GROUPS OF GUIDELINES

- **POSTCLOSURE PERFORMANCE**
- **PRECLOSURE RADIOLOGICAL SAFETY**
- **ENVIRONMENTAL, SOCIOECONOMIC, AND TRANSPORTATION IMPACTS**
- **EASE AND COST OF SITING, CONSTRUCTION, OPERATION, AND CLOSURE**

EACH GROUP HAS

- **"SYSTEM GUIDELINES" THAT PROVIDE GENERAL REQUIREMENTS (e.g., ...SEPARATION OF RADIOACTIVE WASTE FROM THE ACCESSIBLE ENVIRONMENT AFTER CLOSURE...)**
- **"TECHNICAL GUIDELINES" THAT IDENTIFY FACTORS TO BE CONSIDERED (e.g., GEOHYDROLOGY, GEOCHEMISTRY, ROCK CHARACTERISTICS...)**

10 CFR PART 960 PROVIDES TWENTY-FOUR SITING GUIDELINES IN FOUR GROUPS

POSTCLOSURE PERFORMANCE

- SYSTEM BEHAVIOR
- GEOHYDROLOGY
- GEOCHEMISTRY
- ROCK CHARACTERISTICS
- CLIMATE CHANGES
- EROSION
- DISSOLUTION
- TECTONICS
- HUMAN INTERFERENCE
 - NATURAL RESOURCES
 - SITE OWNERSHIP AND CONTROL

ENVIRONMENTAL, SOCIOECONOMIC, AND TRANSPORTATION IMPACTS

- SYSTEM BEHAVIOR
- ENVIRONMENTAL QUALITY
- SOCIOECONOMIC IMPACTS
- TRANSPORTATION

PRECLOSURE RADIOLOGICAL SAFETY

- SYSTEM BEHAVIOR
- POPULATION DENSITY AND DISTRIBUTION
- SITE OWNERSHIP AND CONTROL
- METEOROLOGY
- OFFSITE INSTALLATIONS AND OPERATIONS

EASE AND COST OF SITING, CONSTRUCTION, OPERATION, AND CLOSURE

- SYSTEM BEHAVIOR
- SURFACE CHARACTERISTICS
- ROCK CHARACTERISTICS
- HYDROLOGY
- TECTONICS

EACH TECHNICAL GUIDELINE SPECIFIES A QUALIFYING CONDITION AND MAY SPECIFY DISQUALIFYING CONDITIONS FOR THE SITE

EXAMPLE: POSTCLOSURE GEOHYDROLOGY

QUALIFYING CONDITION

"THE PRESENT AND EXPECTED GEOHYDROLOGIC SETTING OF A SITE SHALL BE COMPATIBLE WITH WASTE CONTAINMENT AND ISOLATION..."

DISQUALIFYING CONDITION

"...PRE-WASTE-EMPLACEMENT GROUND-WATER TRAVEL TIME FROM THE DISTURBED ZONE TO THE ACCESSIBLE ENVIRONMENT IS EXPECTED TO BE LESS THAN 1,000 YEARS ALONG ANY PATHWAY OF LIKELY AND SIGNIFICANT RADIONUCLIDE RELEASE."

"THE SITE SHALL BE DISQUALIFIED IF EVIDENCE SUPPORTS A FINDING THAT ANY DISQUALIFYING CONDITION IS PRESENT OR ANY QUALIFYING CONDITION CANNOT BE MET"

DEFINITIONS ADOPTED FROM 10 CFR PART 960 AS USED BY THE TASK FORCE

DISQUALIFYING CONDITIONS

- **CONDITION IS PRESENT OR LIKELY TO BE PRESENT**
- **CONDITION NOT PRESENT BUT ADDITIONAL INFORMATION COULD CHANGE CONCLUSION**
- **CONDITION NOT PRESENT AND IT IS UNLIKELY THAT CONCLUSION WILL CHANGE WITH ADDITIONAL INFORMATION**

EVALUATION RESULT

UNSUITABILITY

**LOWER-LEVEL
SUITABILITY**

**HIGHER-LEVEL
SUITABILITY**

DEFINITIONS ADOPTED FROM 10 CFR PART 960 AS USED BY THE TASK FORCE

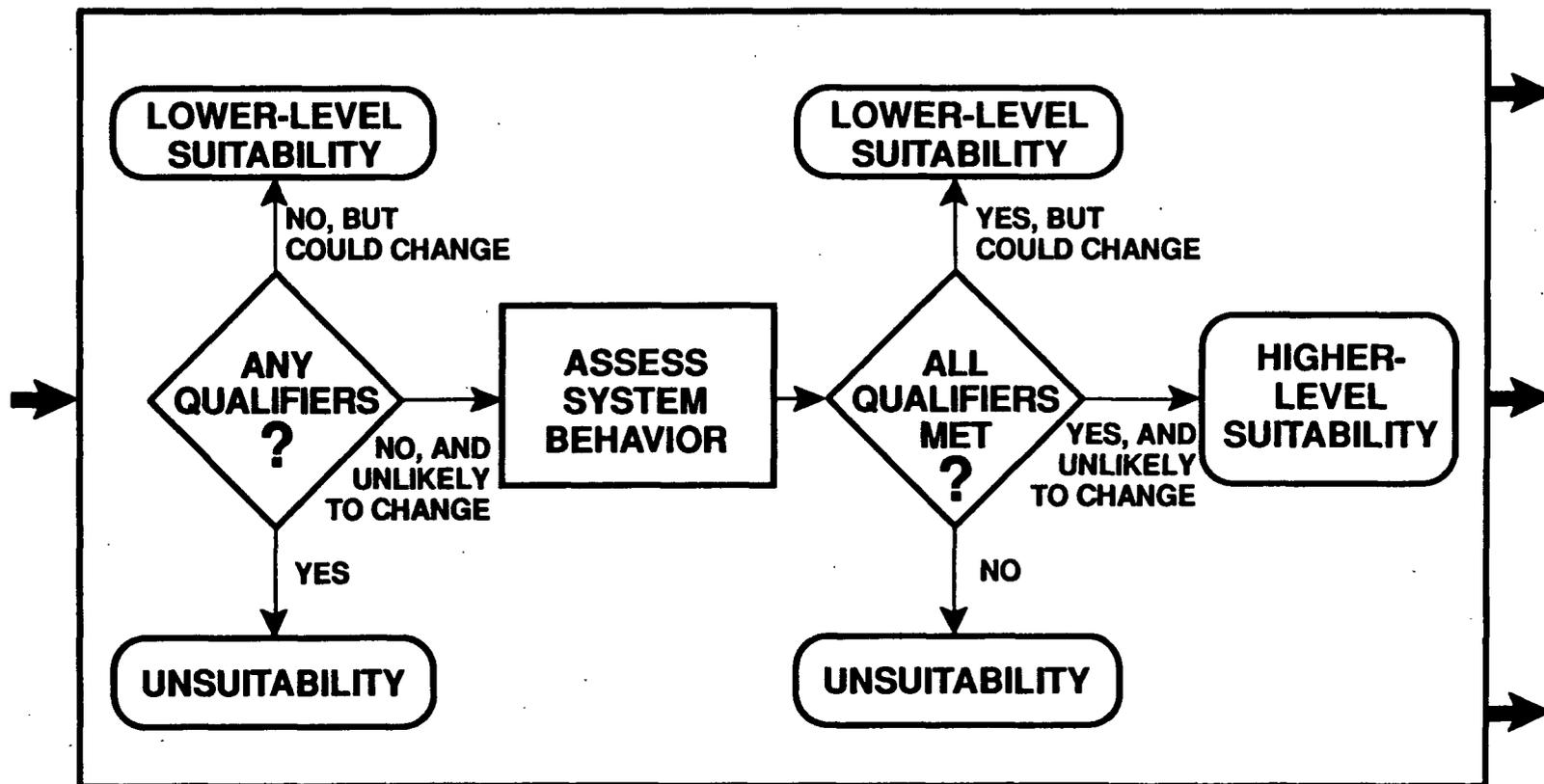
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QUALIFYING CONDITIONS

EVALUATION RESULT

- | | |
|---|--------------------------|
| ● SITE CANNOT MEET CONDITION OR NOT LIKELY TO MEET CONDITION | UNSUITABILITY |
| ● SITE LIKELY TO MEET CONDITION BUT ADDITIONAL INFORMATION COULD CHANGE CONCLUSION | LOWER-LEVEL SUITABILITY |
| ● SITE MEETS CONDITION AND IT IS UNLIKELY THAT CONCLUSION WILL CHANGE WITH ADDITIONAL INFORMATION | HIGHER-LEVEL SUITABILITY |

UTILIZING DOE SITING GUIDELINES, A MODEL WAS DEVELOPED BY THE TASK FORCE FOR EVALUATING SITE SUITABILITY



DISQUALIFYING CONDITIONS ARE EVALUATED BY EXAMINING SITE FEATURES AND CONDITIONS

EXAMPLE: NATURAL RESOURCES

**DISQUALIFYING CONDITION: "PREVIOUS EXPLORATION, MINING, OR
EXTRACTION ACTIVITIES FOR RESOURCES OF COMMERCIAL
IMPORTANCE AT THE SITE HAVE CREATED
SIGNIFICANT PATHWAYS..."**

GENERAL STEPS IN THE EVALUATION

- 1. INTERPRET DISQUALIFYING CONDITION IN TERMS OF SITE
FEATURES AND CONDITIONS**
- 2. EVALUATE THE LIKELIHOOD THAT CONDITION IS PRESENT
(TO MAKE UNSUITABILITY OR LOWER-LEVEL SUITABILITY FINDINGS)**
- 3. EVALUATE THE LIKELIHOOD THAT NEW INFORMATION WILL
CHANGE CONCLUSIONS (TO MAKE HIGHER-LEVEL FINDINGS)**

QUALIFYING CONDITIONS ARE EVALUATED BASED ON ASSESSMENTS OF SYSTEM BEHAVIOR

EXAMPLE: POSTCLOSURE GEOHYDROLOGY

**QUALIFYING CONDITION: "THE PRESENT AND EXPECTED
GEOHYDROLOGIC SETTING OF A SITE SHALL BE COMPATIBLE
WITH WASTE CONTAINMENT AND ISOLATION..."**

GENERAL STEPS IN THE EVALUATION

- 1. IDENTIFY FEATURES AND CONDITIONS IMPORTANT TO
BEHAVIOR**
- 2. EVALUATE SITE, EXPLICITLY CONSIDERING ITEMS FROM
STEP 1 AND UNCERTAINTIES IN DATA AND MODELS**
- 3. EVALUATE LIKELIHOOD THAT BEHAVIOR IS ACCEPTABLE
(TO MAKE HIGHER-LEVEL FINDINGS)**
- 4. EVALUATE THE LIKELIHOOD THAT NEW INFORMATION WILL
CHANGE CONCLUSIONS (TO MAKE HIGHER-LEVEL FINDINGS)**

EVALUATIONS MAY BE EITHER QUALITATIVE OR QUANTITATIVE

QUALITATIVE

QUANTITATIVE

**LOWER-LEVEL
FINDINGS**

**"THE WEIGHT OF
EVIDENCE
INDICATES BEHAVIOR
IS ACCEPTABLE"**

OR

**"THE PROBABILITY THAT
BEHAVIOR MEETS
A THRESHOLD IS
GREATER THAN .1 OR .01"**

**HIGHER-LEVEL
FINDINGS**

**"CONCLUSIONS
ARE UNLIKELY TO
CHANGE"**

OR

**"THERE IS LESS THAN
.1 OR .01 PROBABILITY
THAT ADDITIONAL
INFORMATION WILL
CHANGE CONCLUSIONS"**

**THE SAME EVALUATION STEPS APPLY TO
EACH GROUP OF SITING GUIDELINES,
ALTHOUGH THE TYPES OF ASSESSMENTS
DIFFER**

- **ACCEPTABLE BEHAVIORS FOR POSTCLOSURE PERFORMANCE AND PRECLOSURE RADIOLOGICAL SAFETY ARE DEFINED BY REGULATORY STANDARDS**
- **ACCEPTABLE ES&T IMPACTS WILL BE DETERMINED AS PART OF ENVIRONMENTAL STUDIES**
- **ACCEPTABLE BEHAVIOR FOR "EASE AND COST" GUIDELINES IS REASONABLY-AVAILABLE TECHNOLOGY**

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THE CURRENT EVALUATION REVIEWS THE STATUS OF ALL TECHNICAL AND SYSTEM GUIDELINES ACCORDING TO PROCEDURES JUST DISCUSSED

- **REVIEWS DATA AND CONCLUSIONS OF THE ENVIRONMENTAL ASSESSMENT (EA)**
- **REVIEWS NEW INFORMATION AND ANALYSES DEVELOPED SINCE THE EA**
- **DETERMINES IF DISQUALIFYING CONDITIONS ARE PRESENT**
- **DETERMINES STATUS OF INFORMATION TO SUPPORT HIGHER-LEVEL FINDINGS**
- **IDENTIFIES INFORMATION NEEDED BEFORE HIGHER-LEVEL FINDINGS CAN BE MADE**
- **PROVIDES PEER-REVIEWED EVALUATION RESULTS TO THE DOE**

STATUS OF POSTCLOSURE GUIDELINE EVALUATIONS BY ESSE CORE TEAM

FINDING THAT CAN BE SUPPORTED

GUIDELINE	DISQUALIFYING CONDITION	QUALIFYING CONDITION
SYSTEM	NA	CONDITION IS LIKELY TO BE PRESENT
GEOHYDROLOGY	CONDITION IS NOT LIKELY TO BE PRESENT	CONDITION IS LIKELY TO BE PRESENT
GEOCHEMISTRY	NA	CONDITION IS LIKELY TO BE PRESENT
ROCK CHARACTERISTICS	NA	CONDITION IS PRESENT AND FUTURE INFORMATION UNLIKELY TO CHANGE CONCLUSION
CLIMATIC CHANGES	NA	CONDITION IS LIKELY TO BE PRESENT
EROSION	CONDITION IS NOT PRESENT AND FUTURE INFORMATION UNLIKELY TO CHANGE CONCLUSION	CONDITION IS PRESENT AND FUTURE INFORMATION UNLIKELY TO CHANGE CONCLUSION

STATUS OF POSTCLOSURE GUIDELINE EVALUATIONS BY ESSE CORE TEAM

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FINDING THAT CAN BE SUPPORTED

GUIDELINE	DISQUALIFYING CONDITION	QUALIFYING CONDITION
DISSOLUTION	CONDITION IS NOT PRESENT AND FUTURE INFORMATION UNLIKELY TO CHANGE CONCLUSION	CONDITION IS PRESENT AND FUTURE INFORMATION UNLIKELY TO CHANGE CONCLUSION
TECTONICS	CONDITION IS NOT PRESENT AND FUTURE INFORMATION UNLIKELY TO CHANGE CONCLUSION	CONDITION IS LIKELY TO BE PRESENT
NATURAL RESOURCES	(1) CONDITION IS NOT PRESENT AND FUTURE INFORMATION UNLIKELY TO CHANGE CONCLUSION (2) CONDITION IS NOT PRESENT AND FUTURE INFORMATION UNLIKELY TO CHANGE CONCLUSION	CONDITION IS LIKELY TO BE PRESENT
SITE OWNERSHIP AND CONTROL	CONDITION IS NOT PRESENT AND FUTURE INFORMATION UNLIKELY TO CHANGE CONCLUSION	CONDITION IS PRESENT AND FUTURE INFORMATION UNLIKELY TO CHANGE CONCLUSION

STATUS OF PRECLOSURE GUIDELINE EVALUATIONS BY ESSE CORE TEAM

FINDING THAT CAN BE SUPPORTED

GUIDELINE	DISQUALIFYING CONDITION	QUALIFYING CONDITION
<u>PRECLOSURE RADIOLOGICAL SAFETY</u>		
SYSTEM	NA	CONDITION IS PRESENT AND FUTURE INFORMATION UNLIKELY TO CHANGE CONCLUSION
POPUL. DENSITY & DISTRIBUTION	(1,2,3) CONDITIONS ARE NOT PRESENT AND FUTURE INFORMATION UNLIKELY TO CHANGE CONCLUSION	CONDITION IS PRESENT AND FUTURE INFORMATION UNLIKELY TO CHANGE CONCLUSION
SITE OWNERSHIP AND CONTROL	NA	CONDITION IS PRESENT AND FUTURE INFORMATION UNLIKELY TO CHANGE CONCLUSION
METEOROLOGY	NA	CONDITION IS PRESENT AND FUTURE INFORMATION UNLIKELY TO CHANGE CONCLUSION
OFFSITE INSTALLATIONS AND OPERATIONS	CONDITION IS NOT PRESENT AND FUTURE INFORMATION UNLIKELY TO CHANGE CONCLUSION	CONDITION IS PRESENT AND FUTURE INFORMATION UNLIKELY TO CHANGE CONCLUSION

STATUS OF PRECLOSURE GUIDELINE EVALUATIONS BY ESSE CORE TEAM

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FINDING THAT CAN BE SUPPORTED

GUIDELINE	DISQUALIFYING CONDITION	QUALIFYING CONDITION
<u>PRECLOSURE ENVIRONMENTAL QUALITY - SOCIOECONOMIC IMPACTS - TRANSPORTATION</u>		
SYSTEM	NA	CONDITION IS LIKELY TO BE PRESENT
ENVIRONMENTAL QUALITY	(1) CONDITION IS NOT LIKELY TO BE PRESENT (2) CONDITION IS NOT PRESENT AND FUTURE INFORMATION UNLIKELY TO CHANGE CONCLUSION (3) CONDITION IS NOT LIKELY TO BE PRESENT	CONDITION IS LIKELY TO BE PRESENT
SOCIOECONOMIC IMPACTS	CONDITION IS NOT LIKELY TO BE PRESENT	CONDITION IS LIKELY TO BE PRESENT
TRANSPORTATION	NA	CONDITION IS LIKELY TO BE PRESENT

STATUS OF PRECLOSURE GUIDELINE EVALUATIONS BY ESSE CORE TEAM

FINDING THAT CAN BE SUPPORTED

GUIDELINE	DISQUALIFYING CONDITION	QUALIFYING CONDITION
	<u>EASE AND COST OF SITING, CONSTRUCTION, OPERATION, AND CLOSURE</u>	
SYSTEM	NA	CONDITION IS LIKELY TO BE PRESENT
SURFACE CHARACTERISTICS	NA	CONDITION IS PRESENT AND FUTURE INFORMATION UNLIKELY TO CHANGE CONCLUSION
ROCK CHARACTERISTICS	CONDITION IS NOT PRESENT AND FUTURE INFORMATION UNLIKELY TO CHANGE CONCLUSION	CONDITION IS LIKELY TO BE PRESENT
HYDROLOGY	CONDITION IS NOT PRESENT AND FUTURE INFORMATION UNLIKELY TO CHANGE CONCLUSION	CONDITION IS PRESENT AND FUTURE INFORMATION UNLIKELY TO CHANGE CONCLUSION
TECTONICS	CONDITION IS NOT PRESENT AND FUTURE INFORMATION UNLIKELY TO CHANGE CONCLUSION	CONDITION IS PRESENT AND FUTURE INFORMATION UNLIKELY TO CHANGE CONCLUSION